

## PEL5D002 ANTENNAS & WAVE PROPAGATION

### MODULE- I

**Electromagnetic radiation and antenna fundamentals-** Review of electromagnetic theory: Vector potential, Solution of wave equation, retarded case, Hertzian dipole. Antenna characteristics: Radiation pattern, Beam solid angle, Directivity, Gain, Input impedance, Polarization, Bandwidth, Reciprocity, Equivalence of Radiation patterns, Equivalence of Impedances, Effective aperture, Vector effective length, Antenna temperature.

### MODULE-II

**Wire antennas-** Short dipole, Radiation resistance and Directivity, Half wave Dipole, Monopole, Small loop antennas. Antenna Arrays: Linear Array and Pattern Multiplication, Two-element Array, Uniform Array, Polynomial representation, Array with non-uniform Excitation-Binomial Array

### MODULE- III

**Aperture Antennas-** Magnetic Current and its fields, Uniqueness theorem, Field equivalence principle, Duality principle, Method of Images, Pattern properties, Slot antenna, Horn Antenna, Pyramidal Horn Antenna, Reflector Antenna-Flat reflector, Corner Reflector, Common curved reflector shapes, Lens Antenna

### MODULE- IV

**Special Antennas-** Long wire, V and Rhombic Antenna, Yagi-Uda Antenna, Turnstile Antenna, Helical Antenna- Axial mode helix, Normal mode helix, Biconical Antenna, Log periodic Dipole Array, Spiral Antenna, Microstrip Patch Antennas.

**Antenna Measurements-** Radiation Pattern measurement, Gain and Directivity Measurements, Anechoic Chamber measurement.

### ADDITIONAL MODULE (TERMINAL EXAMINATION-INTERNAL)

**Radio wave propagation-** Calculation of Great Circle Distance between any two points on earth, Ground Wave Propagation, Free-space Propagation, Ground Reflection, Surface waves, Diffraction, Wave propagation in complex Environments, Tropospheric Propagation, Tropospheric Scatter. Ionospheric propagation: Structure of ionosphere, Sky waves, skip distance, Virtual height, Critical frequency, MUF, Electrical properties of ionosphere, Effects of earth's magnetic fields, Faraday rotation, Whistlers.

### TEXT BOOKS

1. **Electromagnetic Waves and Radiating Systems**, E. C. Jordan and K. G. Balmain  
Pearson Education Publications, 1968
2. **Antennas and Wave Propagation**, A.R.Harish, M. Sachidanada, Oxford University Press, 2007
3. **Antenna Theory Analysis and Design**, C. A. Balanis, John Wiley Publications, Second Edition, 2005

### REFERENCES BOOKS

1. **Antennas for all Applications**, J.D.Kraus, Ronald J Marhefka and Ahmad S Khan, Tata McGraw-Hill Book Company. Third Edition, 2008
2. **Antenna Wave Propagation**, G.S.N.Raju, Pearson Education, 2006
3. **Antenna and Radio Wave Propagation**, R. E. Collin, McGraw Hill Publications, 1985.
4. **Antenna Analysis and Design**, W.L Stutzman and G.A. Thiele, John Wiley Publications, 2012.